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Certain Phonological Skills in Late Talkers

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While there is general agreement among researchers in the field of language and learning disabilities upon the language hypothesis for reading failure, little research has been explored concerning the relationship between the phonological production skills of preschool children and the same children's prereading abilities in kindergarten.

This study examined two aspects of phonological skill

(a) the relationship of early phonological production errors and later success on phonological awareness and general prereading skill, and (b) determining if prereading deficits in a group of children with a history of language delay reside specifically in the phonological awareness items or the prereading score in general.

The subjects used for this study included 29 "normal" talkers and 30 "late talkers", as determined by the Language Development Survey (Rescorla, 1989) when the subjects were between 20-34 months. When the subjects were three years old, a language sample was obtained and later phonemically transcribed from audio tape and entered into the PEPPER computer program to compute the percentage consonants correct (PCC) for each child. The subjects were later evaluated during their kindergarten year for reading readiness, using the Developmental Skills Checklist.

This study found that Late Talkers have significantly lower PCCs than there normal talking peers at age three, but their PCCs do not predict their prereading or phonological awareness skills at kindergarten. Phonological awareness was further investigated in terms of suprasegmental and segmental levels of phonological awareness, there was no significant difference between the groups on either level of phonological awareness. However, there was a nonsignificant trend ($p<.10$) in favor of the normals on the segmental level of phonological awareness. Considerable variable in

performance was found on this measure, indicating that important differences between the groups might be found to be significant if a larger sample were employed. Late Talkers scored within the normal range but considerably lower than their peers with normal language history in total prereading at kindergarten. Their primary deficit in the prereading measure resided in the memory subtest, which contained the segmental level of phonological awareness as well as short term verbal memory items. Short term verbal memory items have been shown (Jorm & Share, 1983) to reflect difficulty in retrieval of phonological codes from memory in learning disabled students.

It seems that Late Talkers have difficulties in manipulating sound segments, and perhaps in verbal short term memory. Skills such as retrieving phonological codes from memory and phonological awareness are known to be related to reading acquisition and to learning disorders (Blachman, 1989). These findings strengthen the suggestion that Late Talkers may be at risk for reading failure even though general oral language skills are in the normal range (Paul & Laszlo, 1992).

CERTAIN PHONOLOGICAL SKILLS IN LATE TALKERS

by

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INTRODUCTION AND STATEMENT OF PURPOSE

INTRODUCTION

Many children are challenged by various forms of learning disabilities that can have lifelong effects. One very important area in the field of learning disabilities is the realm of reading disorders. The problems that poor readers face may have long-term consequences affecting their choice of life-time occupational goals. Children who have a difficult time with academics may not continue their education and settle for careers that they would otherwise not have chosen for themselves, or even fail to complete school. It is the goal that children who are at risk for reading disorders may be identified at an early age, with the hope of changing the course of their future to allow them the chance to succeed in school and in future goals they may set for themselves.

It is known that children with a history of delayed language development as older preschoolers are at risk for reading and learning disabilities (Aram & Nation, 1980). Few prospective studies, though, have followed children who showed slow language development as toddlers to assess their

risk for reading problems. The present study will examine this risk.

Several subtypes of reading disorder are discussed in the literature (Kamhi & Catts, 1989; Vellutino, 1977). One recent theory stresses the importance of phonological awareness skills in reading acquisition. These skills include the ability to divide words into syllables and sounds, blend sounds into words, and recognize alliteration and rhyme. Phonological awareness skills particularly have been found to be highly related to reading skill (Blachman, 1989). Although there has been extensive research in the area of phonological awareness and reading ability, not much has been done concerning the relationship of phonological production skills in preschool children and how those measurements relate to phonological awareness and reading acquisition.

This study will examine two aspects of phonological skill: (a) the relationship of early phonological production errors and later success on phonological awareness and general prereading skill, and (b) the determination if prereading deficits reside specifically in the phonological awareness items or in the general prereading score.

STATEMENT OF PURPOSE

The purpose of this study was to explore the relationship between the phonological production skills and

phonological awareness and other prereading abilities in two groups of children: (a) late talkers who were identified as slow in expressive language development at age two, and (b) normal preschoolers. The questions of concern to this study include:

1. Is there a significant difference in percentage consonants correct (PCC) gathered from a free speech sample between the Normals and the Late Talkers at age three?

2. Is there a significant difference in the performance of the Normals and the Late Talkers on a prereading measure when in kindergarten?

3. Is there a significant difference in performance on the phonological awareness items on the prereading measure between the groups when in kindergarten?

4. Is there a correlation between percentage consonants correct (PCC) in a free speech sample at age 3 and the prereading score when in kindergarten?

5. Is there a correlation between PCC in free speech at age 3 and the score on phonological awareness items of a prereading battery at kindergarten?

The research questions lead to the following hypothesis:

1. There will be a significant difference between the groups in percentage consonants correct (PCC) in free speech at age three.

2. There will be a significant difference in the

performance of the Normals and Late Talkers on the prereading measure in kindergarten.

3. There will be a significant difference between the groups on the performance of phonological awareness items on the prereading battery.

4. There will be a significant correlation between PCC at age three and prereading score at kindergarten.

5. There will be a significant correlation between PCC at age three and phonological awareness scores at kindergarten.

DEFINITION OF TERMS

The following are definitions of terms used for the purpose of this study.

1. Dyslexia: (Reading disability), (RD) "A disorder manifested by difficulty in learning to read despite conventional instruction, adequate intelligence and sociocultural opportunity. It is dependent upon fundamental cognitive disabilities which are frequently of constitutional origin" (World Federation of Neurology, cited in Rutter, 1978).
2. Late talker: Children who produce fewer than 50 words (by parent report) at age 20 months on the Language Development Survey (Rescorla, 1989).
3. Learning disability (LD): "refers to a heterogeneous group of disorders manifested by

significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to central nervous system dysfunction. Even though a learning disability may occur concomitantly with other handicapping conditions or environmental influences it is not the direct result of those conditions or influences." (National Joint Committee on Learning Disabilities, 1982).

4. Normal language history: Children who produce 50 words or more (by parent report) by age 20-34 months on LDS (Rescorla, 1989).

5. Percentage Consonants Correct (PCC): is calculated from a speech sample by using the formula:

$$PCC = \frac{\text{Number of Correct Consonants}}{\text{Number of Correct + Incorrect Consonants}} \times 100$$

(Shriberg & Kwaitkowski, 1982)

6. Phonology: The study of the rules in which speech sounds are selected and combined to produce oral speech.

7. Phonological awareness: The explicit knowledge about the sound structure of a language (Catts, 1989). Also referred to as phonological processing.

8. Reading readiness: Particular curriculum-related

knowledge and skills that the child has acquired prior to the child's participation in a particular academic or preacademic program (CTB: McGraw-Hill, 1990).

CHAPTER II

REVIEW OF THE LITERATURE

Many different hypothesis and theories have been developed to explain why some children have problems learning to read. Included are the perceptual deficit hypothesis, intersensory integration deficit hypothesis, and language deficit hypothesis.

PERCEPTUAL DEFICIT HYPOTHESES

Vellutino (1977) explained that in 1925 and 1937 Orton was the first to describe dyslexia as a deficit in visual abilities. He suggested that delayed development of hemispheric dominance brings about the failure to suppress "mirror images" of visual events (b/d, was/saw). Orton, and others in support of this view, hypothesized that dyslexia is the result of visual organization and memory problems.

Several studies have presented empirical evidence that fails to support this hypothesis and have concluded that problems in verbal processing and memory account for what Orton believed to be perceptual deficits. Liberman, Shankweiler, Orlando, Harris, and Berti (1971, cited in Vellutino, 1977) found that the transpositioning of sequences that Orton found accounted for only a small

percentage of the errors made by dyslexics and that the these errors were inconsistent among subjects. They concluded that positional and directional errors were mislabeling errors rather than perceptual misinterpretations.

INTERSENSORY INTEGRATION DEFICIT HYPOTHESIS

Birch (1962, cited in Vellutino, 1977) posed a hypothesis which suggests that reading disorders are a result of deficient integration of the sensory systems. Birch found that poor readers between kindergarten and sixth grade were less able to match simple rhythmic patterns with their visual representations than average reading peers. Other researchers (Senf, 1969; Senf & Feshbach, 1970; Senf & Freundl, 1972 cited in Vellutino, 1977) found similar results, when they found notable differences in the temporal organization of auditory and visual stimuli presented concurrently. However, it was pointed out that attention and memory factors were heavily relied upon, indicating that the memory and attention deficits of poor readers could have been interfering with their measurements.

VERBAL PROCESSING DEFICIT HYPOTHESIS

In the review of the literature, it is apparent that most current researchers in the field believe that language development is critical to the acquisition of reading

skills. Strominger & Bashir (1977, cited in Maxwell & Wallach, 1982) explained that the child who demonstrates an early disruption of language acquisition is at risk for future academic failures or difficulties in reading.

Rabonovich (1959, 1968, cited in Vellutino, 1977) was one of the first to consider that dyslexia may be associated with language deficiencies. He observed that poor readers exhibit difficulties in expressive language. He reported that poor readers consistently performed poorly on tests of "verbal intelligence" while performance on "nonverbal intelligence" remained average. Consequently, he proposed that reading disabilities are associated with specific language disabilities.

Reading disabilities are widely considered a subgroup of learning disabilities and both are considered to result from higher language disorders (Wallach 1982). Mattingly (1972) stated that reading is a language-based skill contingent upon certain features of linguistic abilities. Similarly Stark (1975) stated that the difficulty in learning to read is related to problems in processing language.

It is evident that reading disabilities are currently considered to be a breakdown in oral language skills. One subtype of the verbal deficit hypothesis is the phonological deficit hypothesis.

Phonological Deficit Hypothesis

The phonological deficit theory suggests that children who exhibit deficient reading skills also exhibit deficient phonological skills. Recent studies have centered on three separate and possibly related aspects of phonological processing: (a) phonological awareness, (b) phonological production and (c) the retrieval of phonological codes from memory (Catts, 1986).

Phonological Awareness. Phonological awareness is the ability to divide words into syllables and sounds, blend sounds into words, and recognize alliteration and rhyme. As Ball and Blachman (in press) pointed out, phoneme awareness repeatedly has been shown to be related to early reading achievement. Stanovich (1986) hypothesized that, if there is a specific cause of reading disorder, it can be found in the area of phonological awareness. He stated that slow development in phonological awareness delays "early code-breaking progress and initiates the cascade of interacting achievement failures and motivational problems" (p. 393). Several researchers (Bradely & Bryant, 1983; Stanovich, 1986; Stanovich, Cunningham & Cramer, 1984) have demonstrated that performance on phonological awareness tasks in the early stages of learning to read is a strong indicator of later reading achievement.

In one longitudinal research study conducted by Bradley and Bryant (1983), it was determined that phonological

awareness abilities at an early age predict the literacy abilities of the same children 3 years later through their rhyme and alliteration awareness. Phonological awareness skills have not only proven to be a strong indicator for reading achievement, but they also improve with literacy skills. Thus, the relationship is considered to be reciprocal in nature (Catts, 1989).

Further research has shown that phonological awareness can be taught and when this is done, reading improvement often results. Ball and Blachman (in press) performed an experiment in which they randomly selected 30 kindergarten students from each of three different urban schools. Students whose scores were more than 1.5 standard deviations below the mean and who obtained raw scores greater than three on the Woodcock Mastery Test word identification subtest were excluded from this study. Each of the 90 subjects were randomly assigned to one of three groups. Group I was a phoneme segmentation training group in which subjects were instructed in sound-symbol correspondence and phoneme segmentation. Control group I was instructed in sound symbol correspondence alone. Control group II received no instruction. The instruction lasted 7 weeks. Results obtained after the 7 weeks displayed that phoneme awareness instruction combined with instruction in relating phonemic segments to alphabet letters significantly improved the early reading skills of the children in the first group.

The performance of group II was not significantly improved after the 7 weeks of instruction. Ball and Blachman concluded that kindergarten children can be instructed in phoneme segmentation, and that sound-symbol correspondence training alone does not result in significant gains in children's early reading abilities.

It is apparent that phonological awareness skills contribute to the early reading success in children. It is also apparent that these skills can be taught to children who do not learn them on their own. In a language, such as English, in which the writing system is based on an alphabetic principle, such skills as phonological awareness seem to be imperative for reading success.

Phonological Production. The relationship between phonological production or articulation and reading disabilities has been extensively researched and has been thought of as a causal link. This is an area in which early identification of possible reading disorders may be achieved. However, most research has dealt with the phonological production of children already identified as reading disordered.

Catts (1986) conducted a study to investigate the speech production phonological processing abilities of children who are reading disordered (RD). A group of RD children matched with a group of normal reading children performed tasks involving naming, word repetition, and

phrase repetition. Results were obtained on the basis of comparisons between the number of speech production errors of each group, and the relationship between the errors and the RD children's level of reading ability. The RD subjects made significantly more errors on the production of multisyllabic words and short phrases. The relationship between speech production errors and reading level of RD subjects is supported by correlations found between speech production tasks and reading ability. He concluded that these support the idea that RD children have phonological deficits and that these deficits may influence spoken as well as written language.

In an earlier research study conducted by Snowling (1981), RD children were compared to normal reading children on the basis of two experiments. The first experiment consisted of reading nonsense words aloud. The results showed that both groups were able to read one-syllable nonsense words equally well, but the RD children had more difficulty than the normal reading children in reading two-syllable nonsense words and especially those words containing consonant clusters. In the second experiment, subjects were asked to repeat real words and nonsense words of two-, three- and four-syllables. Both groups had more difficulty with the nonsense words, however, it was found that the RD children had greater difficulty with this task. Snowling concluded that the RD children were affected by the

phonological complexity more than their peers. These deficits also affected their ability to process both written and spoken words.

As concluded in these research studies, RD children make significantly more errors in speech production than their normal reading peers. However, few studies have shown a link between preschool phonological production skills and early reading skills.

One follow-up study of 36 children who received preschool speech services at a University phonological clinic was conducted by Shriberg and Kwiatkowski (1988). Their purpose was to make a connection between preschool phonological skills and "exceptional educational needs" during school age years. Findings indicated that a high percentage of the children continued to require speech and language and other special educational needs in elementary school and beyond. Although, reading ability was not directly dealt with, it is apparent that a delay in early phonological development may be an indicator of later academic difficulty.

Retrieval of Phonological Codes from Memory. The inability to retrieve phonological cues from memory is known as the storage deficit hypothesis. The relationship between memory and reading has also been extensively researched.

Katz (1986) found that poor readers had difficulty recalling phonologically long words, and found that the

errors made were phonologically related to the intended word. He concluded that poor readers had difficulty developing phonological representations of words which makes it difficult to recall many multisyllabic words. Jorm and Share (1983) proposed that the differences in aspects of phonological processing results from the differing ability to code phonological information in long- term memory. The effectiveness with which this information is represented influences the speed at which it can be retrieved.

Wiig and Semel (1975) found that RD children performed significantly poorer on word retrieval tasks, characterized by slower naming, errors in naming, and longer latency on responses. Furthermore, Blachman (1984) found rapid automatic naming was a stable indicator for reading success. In addition, research has indicated that these retrieval problems are not significant in learning disabled children who do not exhibit reading failure. The retrieval errors found in RD children are typically phonetically related rather than semantically related as characteristically found in normal and learning disabled children (Roth & Spekman, 1989).

Roth and Spekman (1989) suggest that RD children have adequately developed lexical reserves, but cannot retrieve the information as accurately as their normal reading peers. They gave clinical examples which include: (a) difficulties in retrieving words, and (b) consistent use of

circumlocutions. They further suggest a reciprocal relationship between higher language functioning (e.g., memory) and reading. While the language deficits adversely affect reading, they also believe that reading deficits may also adversely affect additional language development. They suggest that deficient reading skills affect the development of semantic knowledge, due to the RD child's inability to read effectively.

SUMMARY

The review of the literature shows that researchers generally agree upon the language hypothesis for reading failure. A subtype of this hypothesis is the phonological deficit hypothesis which has strong support for reading failure in children. Researchers have shown significant differences between RD children and their normal reading peers in phonological awareness and phonological production. This study will examine two aspects of the phonological skill: (a) the relationship of early phonological production errors and later success on phonological awareness and general prereading skill, and (b) determining if prereading deficits in a group of children with a history of language delay reside specifically in the phonological awareness items or the prereading score in general.

CHAPTER III

METHODS AND PROCEDURES

SUBJECTS

This study is part of the Portland Language Development Project (PLDP), a longitudinal study of the characteristics and outcome of toddlers who are late talkers.

Subject Recruitment

Subjects were recruited by questionnaire (Appendix A) from three Portland area pediatric clinics. In addition, parents of toddlers who were slow to begin talking were recruited through radio broadcast announcements and by newspaper announcement.

Subject Description

The subjects were first evaluated between the ages of 20 to 34 months, at which time they were put into one of two groups: (a) "late" talkers and (b) "normal" talkers. The group designation was based on expressive vocabulary abilities of the children as reported by their parents using the Language Development Survey (LDS) (Rescorla, 1989) (Appendix B). The LDS is a parent questionnaire containing a checklist of 300 of the most common words in children's early vocabulary. Rescorla reports high reliability,

validity, sensitivity and specificity on the LDS for identifying language delay in toddlers.

Children who were 20-34 months old whose parents reported their expressive vocabulary exceeded 50 words on the LDS were assigned to the "normal" group. All these children were recruited through the questionnaires distributed at pediatric offices. Children recruited from one of the three above named services who were 20-34 months-old whose parents reported their expressive vocabularies were less than 50 words on the LDS were assigned to the "late talkers" (LT) group. The two groups were matched by age, sex ratio, and SES. All subjects in the study passed a hearing screening at 25 dB. (See Table I)

TABLE I

SUMMARY OF DEMOGRAPHIC DATA
FOR SUBJECTS INCLUDED IN THIS STUDY

GROUP	SES*	LDS VOCAB SIZE	INTAKE CA	1988 CA	1990 CA	SEX	RACE
Normal	2.8	207.8	26.1	38.4	71.6	64% (M) 36% (F)	82% (White) 3% (Black) 14% (Other)
Late Talkers	2.7	39.8	25.8	38.5	71.6	78% (M) 27% (F)	93% (White) 3% (Black) 3% (Other)

* based on Myers & Bean's (1968) adaptation of the Hollingshead Four Factor Scale of Social Position.

The Bayley Scale of Infant Mental Development (Bayley, 1969) was administered to each subject by a licensed

psychologist, and no subject was admitted into the study who scored less than 85 on Mental Development Index (MDI) of the Bayley. An informal observational screening for autism, craniofacial, and neuromotor dysfunction was also done.

Twenty-nine children from the normal group and thirty children from the LT group were used for the present study.

PROCEDURES

Early Measures

Subjects were seen for intensive language evaluation at intake (Paul, 1991a). They were seen again for follow-up approximately 1 year later, between the third and fourth birthday. At that time, a battery of language and related assessments were administered (Paul, 1991b). In addition a 15-minute spontaneous language sample was obtained from each subject. For this sample, the parent and child were seated at a table with a standard set of toys. The parent was told to play with the child as she would at home. The language sample was tape recorded and later transcribed orthographically and then phonemically.

The Programs to Examine Phonetic and Phonologic Evaluation Records (PEPPER) (Shriberg & Kwiatkowski, 1988) computer program was used to do a phonological process analysis of the speech samples obtained at this 3-year evaluation. PEPPER procedures involved phonemically transcribing language samples of the 3-year-olds from audio

tapes using broad phonemic transcription. Point-to-point reliability of phoneme transcription was obtained at 98%, using trained transcribers on 10% of speech samples. Data were then entered into the PEPPER program. The PEPPER program automatically computed a Percentage Consonants Correct from these data.

Follow-up Measures

Subjects were seen for further follow-up during their kindergarten year (1990). At that time, language assessment was again conducted. In addition, reading readiness was assessed, using the Developmental Skills Checklist (DSC) (CTB McGraw-Hill, 1990) (Appendix C). The DSC is an individually administered, standardized measure of school readiness. The prereading section of this test was administered. Four subtests of the DSC comprise the prereading score (see Table II). The DSC provides standard scores for each subtest and for the total prereading battery.

In addition item analysis was done to identify items on the DSC that involve phonological awareness skills. The items that were considered as phonological awareness items include: (a) identifying beginning and ending sounds, and blending C-V-C words, from the memory subtest; and (b) segmenting compound words, segmenting words into syllables, and rhyming from the auditory subtest. Phonological awareness items from the memory subtest appear to operate at

TABLE II

SAMPLE ITEMS FROM THE DEVELOPMENTAL SKILLS CHECKLIST

LANGUAGE
Name body parts pointed to by examiner, e.g., neck, shoulder, elbow, wrist
State functions of body parts, e.g., eyes ears nose
State personal information, e.g., name, age
Label objects, e.g., ball, girl
Demonstrate knowledge of position words, .g., back, front, between
Tell a story about a sequence of five pictures of a boy putting on shoes
Demonstrate knowledge of opposites, e.g., hot, fast, big

MEMORY
Non-phonological awareness items:

Recall digits, e.g., 7-2-9-6
Recall names of characters in a story
Follow 3- and 4- part directions
Name alphabet letters

Phonological awareness Items:

Identify initial sound (not letter) in words
Identify final sound (not letter) in words
Blend three sounds to make a CVC word, e.g., him, red, sat

AUDITORY
Non-phonological awareness items:

Discriminate same/different, e.g., cave-gave, walk-walk, line-lime

Phonological awareness items:

Segment sentences into words, e.g., The dog ran.
Segment words into syllables, e.g., oatmeal, table
Identify rhymes for given words, e.g., boat, tree

PRINT CONCEPTS
Take a book from the examiner, hold it with appropriate orientation and turn pages in conventional direction
Identify pictures of people reading
Differentiate print from pictures
Differentiate print from numbers
Identify components of writing, e.g., beginning, period, capital letter

(Paul & Laszlo, 1992)

the segmental level involving manipulation of single phonemes. Those from the auditory subtest operate at a suprasegmental level, involving larger units such as syllables and onset/rime.

DATA ANALYSIS

The Pearson Product Moment correlation, a parametric statistic based on the degree of covariance of the pairs of scores relative to the variance within each set of scores, was used to answer the fourth and fifth research questions posed: is there a correlation between PCC in a free speech sample at age 3 and the Developmental Skills Checklist total at kindergarten?, and is there a correlation between PCC in free speech at age 3 and the score on phonological awareness items of a prereading battery at kindergarten?. In calculating the correlation, the estimate of covariance is divided by the estimate of within test variance (Doehring, 1988, p. 137). Six correlations were completed: percent consonants correct with the total DSC score for each group, the percent consonants correct with the phonological awareness items of the memory subtest (segmental level) of the DSC, for each group, and the percent consonants correct with the phonological awareness items of the auditory subtest (suprasegmental level) of the DSC for each group. In addition, Student's T-tests for independent means were performed to determine if difference exists between the

two groups on: (a) PCC at age three, (b) total prereading standard score on the DSC at kindergarten, (c) number of phonological awareness items correct on the memory subtest (segmental level) of the DSC, (d) number of phonological awareness items correct on the auditory subtest (suprasegmental level) of the DSC, (e) standard scores on each of the DSC subtests.

CHAPTER IV

RESULTS AND DISCUSSION

RESULTS

The questions asked in this study were intended to determine if there was a difference between the two diagnostic groups in prereading and phonological awareness ability, and if there was a correlation within the Normal and the Late Talkers group between PCC at three and prereading ability at kindergarten.

The specific questions asked were: (a) Is there a significant difference between the Normals and Late Talkers in percentage consonants correct (PCC) calculated from the free speech samples gathered at age three?, (b) Is there a significant difference in the performance of the Normals and the Late Talkers on the prereading measure in kindergarten?, (c) Is there a significant difference in performance on the phonological awareness items of the prereading battery between the groups at kindergarten?, (d) Is there a correlation between percentage consonants correct (PCC) on a free speech sample at age 3 and the Developmental Skills Checklist (DSC) total prereading score at kindergarten?, (e) Is there a correlation between PCC in a free speech sample at age three and the number of

phonological awareness items correct on the prereading battery at kindergarten?

The means and standard deviations of each group for each score mentioned above were computed and are shown in Table III.

The data were analyzed to determine if differences existed between the groups on eight measures: auditory, memory, language and print concepts subtest standard scores of the DSC, number of phonological awareness items correct from the memory and auditory subtests of the DSC, total DSC prereading standard score in kindergarten, and PCC score at age three.

Table IV shows the Student's T-tests computed to determine if there were significant differences between groups on the eight measures. Significant differences were determined to exist between the groups on three of the eight measures: DSC memory subtest ($p < .009$), DSC total prereading ($p < .018$), and PCC ($p < .00$).

Pearson Product Moment correlations were computed, and are shown in Table V, to determine if there was a correlation between PCC at age three and the language, print concepts, memory, and auditory subtest standard scores of the DSC, the DSC total prereading standard score, and the number of phonological awareness items correct from the

TABLE III

RANGE, MEAN, AND STANDARD DEVIATION FOR EACH GROUP FOR EACH OF THE DEPENDENT MEASURES

MEASURE	GROUP	MEAN	SD	MIN	MAX
DSC Language Subtest (standard score)	Normal	98.21	11.29	76	121
	Late Talkers	92.77	12.37	72	121
DSC Print Concepts Subtest (standard score)	Normal	91.52	10.89	74	114
	Late Talkers	87.17	11.46	69	113
DSC Auditory Subtest (standard score)	Normal	99.07	11.31	79	119
	Late Talkers	93.13	13.27	74	123
DSC Memory Subtest (standard score)	Normal	97.21	13.32	69	124
	Late Talkers	88.23	12.15	66	116
DSC Total Subtest (standard score)	Normal	90.25	10.97	76	121
	Late Talkers	82.20	16.49	71	124
Phonological Awareness (Memory-segmental level) (raw score)	Normal	4.93	3.68	0	11
	Late Talkers	3.43	3.21	0	11
Phonological Awareness (Auditory-suprasegmental level) (raw score)	Normal	5.69	1.76	1	8
	Late Talkers	5.93	1.68	2	8
Percentage Consonants Correct (in a free speech sample at age 3)	Normal	93.21	5.61	72.52	99.13
	Late Talkers	86.49	6.17	74.49	96.17

TABLE IV

POOLED VARIANCE STUDENT'S T-TEST
OF DIFFERENCES BETWEEN LATE TALKERS
AND NORMAL LANGUAGE GROUPS

MEASURES	T-VALUE	SIGNIFICANCE LEVEL
Language subtest of the DSC	-1.763	.08
Print Concepts subtest of the DSC	-1.494	NS
Auditory subtest of the DSC	-1.846	NS
Memory subtest of the DSC	-2.706	.009
Total Prereading on the DSC	-2.438	.018
Phonological Awareness (Memory-segmental level)	-1.666	NS
Phonological Awareness (Auditory-suprasegmental level)	-.545	NS
Percentage Consonants Correct	-4.489	.000

TABLE V

PEARSON PRODUCT MOMENT CORRELATIONS
TO PERCENTAGE CONSONANTS CORRECT

MEASURES	GROUP	r
Language subtest of the DSC	Normal	.369
	Late Talkers	-.176
Print Concepts subtest of the DSC	Normal	.182
	Late Talkers	-.154
Memory subtest of the DSC	Normal	.310
	Late Talkers	-.264
Auditory subtest of the DSC	Normal	.236
	Late Talkers	.101
Total Prereading of the DSC	Normal	.331
	Late Talkers	-.192
Phonological Awareness (Memory-segmental level)	Normal	.293
	Late Talkers	-.005
Phonological Awareness (Auditory-suprasegmental level)	Normal	.052
	Late Talkers	.131

memory and auditory subtests. No significant correlations were found.

DISCUSSION

The Late Talkers have significantly lower PCCs at three, but their PCCs do not predict their prereading or phonological awareness skills at kindergarten. Items from the Language subtest consisted of naming body parts, giving the function of body parts, supplying personal information such as name and age, demonstrating comprehension of locative terms, and producing opposites. The print concepts subtest required subjects to demonstrate how to hold a book, turn pages, find pictures of people reading, differentiate printed letters from pictures and numerals, and identify components of print such as a period, and capital letter. The Memory subtest required the subjects to recall of the names of characters given in a story, contained standard digit span of items, following directions and naming printed letters. Phonological awareness items, from this subtest, required the subject to be able to identify initial and final sounds in words and to blend sounds into words, this is considered a segmental level of phonological awareness. The auditory subtest of the DSC required subjects to discriminate whether two words were the same or different. The items referred to as phonological awareness items on this subtest required the subject to be able to segment

sentences into words, words into syllables and to identify rhymes, this is considered a suprasegmental level of phonological awareness (Paul & Laszlo, 1992).

The Late Talkers group performed as well as the Normals on the suprasegmental level (auditory subtest) of phonological awareness. There was no significant difference between groups on phonological awareness on segmental items. However, there was a nonsignificant trend ($p<.10$) in favor of the normals on this measure. Further, the standard deviations in both groups were large. For the Late Talkers, standard deviations were larger than the mean. This suggests considerable variable in performance on this measure. It is possible that some important differences in phonological awareness at the segmental level exists between the groups, although this difference did not reach significance in this study.

The Late Talkers scored within the normal range but significantly lower than their peers with normal language history in total prereading at kindergarten. This may indicate some risk for school achievement. Their primary deficit in the prereading measure appears to reside in the memory subtest. This subtest contains phonological awareness segmental and short term memory items. These items appear to distinguish children with a history of late talking from peers with normal language history. It seems from these data that the main problem seen in Late Talkers

relates to the ability to manipulate sound segments in words, and perhaps to perform on short term memory items. The short term memory items may also reflect differences in retrieving phonological codes from memory as Jorm and Share (1983) suggest. Skills such as retrieving phonological codes from memory and segmental level phonological awareness are known to be related to reading acquisition (Blachman, 1989). These findings, combined with their low normal performance on the standardized reading readiness section of the DSC, strengthen the suggestion that Late Talkers may be at risk for reading failure even though general oral language skills are in the normal range (Paul & Laszlo, 1992).

CHAPTER V

SUMMARY AND IMPLICATIONS

SUMMARY

Several researchers suggest that poor readers exhibit difficulties in expressive language and higher language processing (Rabonivich 1959, 1968, cited in Vellutino, 1977; Mattingly, 1972; Stark, 1975; Wallach, 1982). They also agree that reading is a language-based skill. More specifically, they believe that phonological awareness ability is a strong predictor of reading success, and that slow development in phonological awareness may contribute to reading failure (Bradley & Bryant, 1983; Stanovich, 1986: Stanovich, Cunningham & Cramer, 1984;).

The purpose of this study was (a) to look at the relationship of early phonological skills and general prereading skill, and (b) to determine if prereading deficits in a group of children with a history language delay reside specifically in the phonological awareness items or in general the prereading score.

The following questions were addressed:

1. Is there a significant difference in percentage consonants correct (PCC) produced in free speech samples

between the Normals and the Late Talkers at age three?

2. Is there a significant difference in the performance of the Normals and the Late Talkers on a prereading measure in kindergarten?

3. Is there a significant difference in performance on the phonological awareness items of the prereading measure between the groups at kindergarten?

4. Is there a correlation between percentage consonants correct (PCC) produced in a free speech sample at age three and the Developmental Skills Checklist (DSC) total at kindergarten?

5. Is there a correlation between PCC and the phonological awareness scores at kindergarten?

The data were analyzed to determine whether there were significant differences between the groups on these measures using the Student's T-test. Correlations with the measures and PCC was obtained using the Pearson Product Moment correlation.

Significant differences were found in PCC between the Normals and the Late Talkers at age three. Significant differences were found on the total prereading score of the DSC between the groups. Significant differences were also found between the groups on the memory subtest. There was no significant correlation between PCC and total prereading score on the DSC. There was no significant correlation between the PCC and the phonological awareness items of the

DSC. There was no significant correlation between PCC at three and language on the DSC at kindergarten.

IMPLICATIONS

Research

Future research in this area would be beneficial to help to determine a specific link between language and reading failure. Research may include comparing other prereading measures to early language and/or articulation development. One may also look more deeply into phonological awareness abilities of language delayed preschoolers and compare this information to the same subject's reading ability a few years later. Exploring the relationship between phonological awareness and/or production and the retrieval of phonological codes from memory may also prove to be beneficial. Further, it would be interesting to see whether there is a correlation between PCC at kindergarten and phonological awareness skill at the same age. If such a relation did exist, articulation intervention could focus on phonological awareness as well as production. Examining the finer levels of phonological awareness as well as testing for phonological awareness specifically may also be of interest, when compared to later academic and reading success.

Clinical

Late Talkers would appear to be at risk for reading problems, as a result of their borderline normal scores on the DSC and differences with items possibly relate to the retrieval of phonological codes from memory and phonological segmentation at the segmental level both of which is known to be related to reading success. This suggests that intervention that took a preventive stance might be useful for these children. That is, any intervention delivered should focus not only on traditional oral language, but on phonological awareness activities that focus on sound segmentation and blending. Low PCC scores at age three suggest phonological delay through the preschool period. Even though early PCC's do not predict phonological awareness two years later for those children whose phonological delays do persist to the late preschool period, articulation intervention would be an ideal setting for phonological awareness training, focusing on sound segments in words. Working on real words and making the sounds in the words explicit, as in a phonological approach could help make the child aware of phonological segments, which will help in building a basis for literacy acquisition.

Phonological awareness ability has also been shown to be linked to poor word recognition and spelling abilities directly affecting reading comprehension, vocabulary, and general knowledge (Blachman, 1989). This further supports

the need for intervention that explicitly teaches phonological awareness skills in children whose phonological delays persist in the late preschool period.

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APPENDIX A

QUESTIONNAIRE

QUESTIONNAIRE FOR PARENTS OF CHILDREN 15-30 MONTHS OLD

What is your child's:

first name? _____

date of birth? _____

Mother's (or primary parent's) full name? _____

Mother's (or primary parent's) phone number? _____

Mother's occupation? _____

Father's occupation? _____

How many different words can your child say? (It's OK if the words aren't entirely clear, as long as you can understand them.)

none _____ 10-30 _____

less than five _____ 30-50 _____

5-10 _____

If your child says fewer than ten words, please list them here:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Does your child put words together to form short "sentences"?

Yes _____ NO_____

If yes, please give three examples here:

_____

_____

_____

Would you be interested in participating in later parts of this study?

Yes _____ No _____

APPENDIX B

LANGUAGE DEVELOPMENT SURVEY

Language Development Survey

The Language Development Survey is designed to measure vocabulary development and early word combinations in young children by the use of parent report. By carefully completing the Language Development Survey, you can help us obtain an accurate picture of your child's developing language skills. Please check off each word your child says. Don't include words your child understands but does not say. It's all right to count words that aren't pronounced clearly. Don't count words which your child repeats after you in imitation but does not say spontaneously.

Thank you for helping us learn more about your child's language development.

Date __/__/__ Your name _____

Child's name _____ Birthdate __/__/__

Sex _____ Age _____

Mother's name _____	Father's name _____
Address _____	Address _____
_____	_____
Telephone _____	Telephone _____
Date of birth _____	Date of birth _____
Marital status _____	Marital status _____
Level of education completed	Level of education completed
_____	_____
Employment:	Employment:
Not employed _____	Not employed _____
Employed part-time _____	Employed part-time _____
Employed full-time _____	Employed full-time _____
Occupation _____	Occupation _____

Please give age and sex of other children in your family _____

Has anyone in your family been slow in learning to talk? _____

If so, who? _____

Was your child premature? _____ How many weeks early? _____

How many ear infections has your child had? _____

Is your child in day care or cared for regularly by a babysitter? _____

If so, how many hours per week? _____

What language is spoken in your home? _____

Please list languages spoken if other than English _____

Are you worried about your child's language development? _____

PLEASE COMPLETE VOCABULARY CHECKLIST ON REVERSE SIDE

Language Development Survey

Please check off each word that your child says SPONTANEOUSLY (not just imitates or understands). It's okay to count words that aren't pronounced clearly or are in "baby talk" ("baba" for bottle.).

FOODS
apple
banana
bread
butter
cake
candy
cereal
cheese
coffee
cookie
crackers
drink
egg
food
grapes
gum
hamburger
hotdog
icecream
juice
meat
milk
orange
pizza
pretzel
raisins
soda
soup
spaghetti
tea
toast
water

TOYS
ball
balloon
blocks
book
crayons
doll
picture
present
slide
swing
teddybear

OUTDOORS
flower
house
moon
rain
sidewalk
sky
snow
star
street
sun
tree

ANIMALS
bear
bee
bird
bug
bunny
cat
chicken
cow
dog
duck
elephant
fish
frog
horse
monkey
pig
puppy
snake
tiger
turkey
turtle

BODY PARTS
arm
bellybutton
bottom
chin
ear
elbow
eye
face
finger
foot
hair
hand
knee
leg
mouth
neck
nose
teeth
thumb
toe
tummy

PLACES
church
home
hospital
library
park
school
store
zoo

ACTIONS
bath
breakfast
bring
catch
clap
close
come
cough
cut
dance
dinner
doodoo
down
eat
feed
finish
fix
get
give
go
have
help
hit
hug
jump
kick
kiss
knock
look
love
lunch
make
nap
open
outside
pattycake
peekaboo
peepee
push
read
ride
run
see
show
shut
sing
sit
sleep
stop
take
throw
tickle
up
walk
want
wash

HOUSEHOLD
bathtub
bed
blanket
bottle
bowl
chair
clock
crib
cup
door
floor
fork
glass
knife
light
mirror
pillow
plate
potty
radio
room
sink
soap
spoon
stairs
table
telephone
towel
trash
T.V.
window

PERSONAL
brush
comb
glasses
key
money
paper
pen
pencil
penny
pocketbook
tissue
toothbrush
umbrella
watch

PEOPLE
aunt
baby
boy
daddy
doctor
girl
grandma
grandpa
lady
man
mommy
own name
pet name
uncle
Ernie, etc.

CLOTHES
belt
boots
coat
diaper
dress
gloves
hat
jacket
mittens
pajamas
pants
shirt
shoes
slippers
sneakers
socks
sweater

VEHICLES
bike
boat
bus
car
motorcycle
plane
stroller
train
trolley
truck

MODIFIERS
allgone
all right
bad
big
black
blue
broken
clean
cold
dark
dirty
dry
good
happy
heavy
hot
hungry
little
mine
more
nice
pretty
red
stinky
that
this
tired
wet
white
yellow
yucky

OTHER
A, B, C, etc.
away
booboo
byebye
excuse me
here
hi, hello
in
me
meow
my
myself
nightnight
no
off
on
out
please
Sesame St.
shut up
thank you
there
under
welcome
what
where
why
woofwoof
yes
you
yumyum
1, 2, 3, etc.

Please list any other words your child uses here:

_____

_____

Does your child combine two or more words into phrases? (e.g. "more cookie," "car byebye," etc.) yes_____ no _____

Please write down **three** of your child's longest and best sentences or phrases.

1. _____

2. _____

3. _____

APPENDIX C

DEVELOPMENTAL SKILLS CHECKLIST

LANGUAGE

Naming Body Parts

→1. O U Neck _____

2. O U Shoulders _____

3. O U Elbow _____

4. O U Wrist _____

5. O U Knees _____

6. O U Ankles _____

_____ Naming Body Parts Total

Stating Function of Body Parts

7. O U Eyes _____

8. O U Nose _____

9. O U Ears _____

10. O U Mouth _____

_____ Function of Body Parts Total

Stating Personal Information

11. O U First Name _____

12. O U Last Name _____

13. O U Age _____

_____ Personal Information Total

Labeling Objects

14. O U _____

_____ Labeling Objects Total

Item | Examiner's Notes

LANGUAGE

Demonstrating Knowledge of Position Words

15. O U Back _____
16. O U Over _____
17. O U Front _____
18. O U Through _____
19. O U Around _____
20. O U Under _____
21. O U Next to _____
22. O U Between _____

_____ Position Words Total

Telling a Five-Part Story in Sequence

23. O U _____

_____ Story Sequence Total

Demonstrating Knowledge of Opposites

24. O U Hot _____
25. O U Fast _____
26. O U Loud _____
27. O U Big _____
28. O U Happy _____
29. O U Good _____

_____ Opposites Total

Item | Examiner's Notes

MEMORY

Recalling Digits

1. O U 3-1-8 _____
2. O U 7-2-9-6 _____
3. O U 4-6-10-5-3 _____

Recalling Names

→4. O U Willie _____

Following Directions

5. O U 3-Part _____
6. O U 4-Part _____

_____ Short Term Memory Total (1 + 2 + 3 + 4 + 5 + 6)

Naming Letters

7. O U r _____
8. O U S _____
9. O U T _____
10. O U u _____
11. O U Y _____
12. O U h _____
13. O U K _____
14. O U e _____
15. O U C _____
16. O U Q _____
17. O U a _____
18. O U d _____

_____ Upper-case Letters (8 + 9 + 11 + 13 + 15 + 16)

_____ Lower-case Letters (7 + 10 + 12 + 14 + 17 + 18)

_____ Naming Letters Total

Item | Examiner's Notes

MEMORY

Identifying Sounds and Letters

Initial

Boot

19. O U Sound <b> _____

20. O U Letter b _____

Mop

21. O U Sound <m> _____

22. O U Letter m _____

Final

Soap

23. O U Sound <p> _____

24. O U Letter p _____

Hen

25. O U Sound <n> _____

26. O U Letter n _____

_____ Initial Consonant Sounds (19 + 21)

_____ Initial Consonants (20 + 22)

_____ Final Consonant Sounds (23 + 25)

_____ Final Consonants (24 + 26)

_____ Sounds and Letters Total (19 + 20 + 21 + 22 + 23 + 24 + 25 + 26)

Blending C-V-C Words

27. O U Him _____

28. O U Red _____

29. O U Sat _____

_____ Blending C-V-C-Words Total

Item | Examiner's Notes

AUDITORY

Identifying Same/Different

1. O U Cave-Gave _____
2. O U Line-Lime _____
3. O U Walk-Walk _____
4. O U Crow-Grow _____
5. O U Sing-Sink _____
6. O U Thought-Thought _____
7. O U Wish-Witch _____
8. O U Farm-Form _____
9. O U Vase-Face _____

_____ Identifying Same/Different Total

Segmenting Sentences

10. O U The dog ran. _____
11. O U His name was Dirk. _____
12. O U Pat threw a stick to Dirk. _____
13. O U Dirk picked up the stick and brought it back. _____

_____ Segmenting Sentences Total

Segmenting Compound Words

14. O U Oatmeal _____
15. O U Raincoat _____

Segmenting Words

16. O U Table _____
17. O U Beginning _____
18. O U Kindergarten _____

_____ Segmenting Words Total (14 + 15 + 16 + 17 + 18)

Rhyming

19. O U Boat _____
20. O U Tree _____
21. O U Rocks _____

_____ Rhyming Total

Item | Examiner's Notes

PRINT CONCEPTS

Holding a Book/
Turning the Pages

1. O U _____

_____ Holding Book/Turning Pages Total

Identifying People Engaged
in Reading Activities

2. O U _____
3. O U _____
4. O U _____

_____ Identifying People Reading Total

Differentiating Print from Pictures/
Differentiating Letters from Numerals

Clock

5. O U Words _____
6. O U Function _____
7. O U Numerals _____
8. O U Function _____

Milk Carton

9. O U Words _____
10. O U Function _____
11. O U Numerals _____
12. O U Function _____

Recess

13. O U Numerals (Shirt) _____
14. O U Numerals (Hopscotch) _____
15. O U Function _____

_____ Differentiating Words/Numerals Total (5 + 7 + 9 + 11 + 13 + 14)

_____ Function of Words/Numerals Total (6 + 8 + 10 + 12 + 15)

PRINT CONCEPTS

Identifying Components of Written Communication

16. O U Beginning _____
17. O U Letter _____
18. O U Word _____
19. O U Sentence _____
20. O U Capital Letter _____
21. O U Period _____

_____ Components of Writing Total